On the Inclinations of the Asteroids.

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(*Read before the American Philosophical Society, May 17, 1889.*)

The forty-ninth page of my little volume on the Asteroids contains a brief statement respecting the orbital positions of these bodies, and the supposed connection between great eccentricity and high inclination. If the phenomena referred to have any bearing on the theory of asteroid formation—in other words, if facts hitherto regarded as isolated prove mutually dependent, may not their discussion point out new and unexpected relations? A more exact examination, at least, of these planetary statistics will not be without interest.

The first column of the following table gives the asteroids in groups of ten, in the order of distances; the second, the limits of the respective groups; and the third, the average inclination of the several clusters.

INCLINATIONS OF THE MINOR PLANETS.

Groups.	Distances.	Av. Inclinations of Groups.
1 to 10	2.13 — 2.28	3° 37′ 32.8″
11 — 20	2.28 — 2.36	7 0 22.1
21 — 30	2.36 — 2.38	11 0 13.9
31 — 40	2.38 — 2.40	12 20 15.2
41 — 50	2.40 — 2.43	6 44 48.1
51 — 60	2.43 — 2.45	5 25 7.4
61 — 70	2.45 — 2.56	7 20 51.5
71 — 80	2.56 — 2.58	10 19 23.2
81 — 90	2.58 — 2.616	9 27 49.3
91 — 100	2.616 — 2.647	8 10 43.1
101 — 110	2.647 — 2.667	7 2 53.5
111 — 120	2.667 — 2.685	8 4 11.0
121 — 130	2.685 — 2.712	9 25 17.1
131 — 140	2.712 — 2.737	8 2 6.1
141 — 150	2.737 — 2.745	10 10 30.0
151 — 160	2.745 — 2.762	8 36 12.7
161 — 170	2.762 — 2.771	11 23 0.2
171 — 180	2.771 — 2.799	10 36 6.2
181 — 190	2.799 — 2.870	8 16 7.1
191 — 200	2.870 — 2.921	8 10 4.8
201 — 210	2.921 — 3.012	7 23 35.3
211 — 220	3.012 — 3 06	7 48 19.0
221 — 230	3.06 — 3.11	5 54 43.0
231 — 240	3.11 — 3.126	8 48 52.6
241 — 250	3.126 — 3.14	7 0 36.9
251 — 260	3.14 — 3.185	10 46 51.3
261 — 270	3 185 — 3.42	8 39 16.8
271 — 280	3.42 — 4 24	6 28 26.3

Remarks.

1. The average inclination of the first hundred (in the order of distance) is..... 8° 8′ 42.66″
   Of the second hundred..... 8 58 38.87
   Of the last eighty..... 7 51 20.15
   And that of the whole two hundred and eighty. 8 21 34.87
2. The inclinations in the edges of the ring are less than the average.
3. Other *minima* are found about the distances 2.44 and 3.09. The *maximum* between 2.36 and 2.40 is distinctly marked.
4. As in the case of other planets, the inclinations vary, though with extreme slowness. It has not been shown, however, that the *average* will change to any great extent.
5. This average compares thus with certain other inclinations:
   Mercury's orbit..... 7° 00′
   Plane of the Sun's equator..... 7 15
   Average inclination of asteroidal comets..... 16 40
6. The *maximum* inclinations of Mercury and Mars are 10° 36′ and 7° 28′ * respectively. The table indicates that *the mean inclination* of the asteroids has not differed greatly from the mean inclination of Mercury.

A Review of the North American Species of Hippotherium.

By E. D. Cope.

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The relation of this genus to the other genera of Perissodactyla was indicated by Kowalewsky in his work on the genus Anthracotherium, published in the "Palæontographica" for 1874. He there showed that the genus occupies a place between Anchitherium and Equus in the genealogical phylum, as it does in geological time. In a paper on the "Systematic Arrangement of the Perissodactyla,"† the present writer placed Hippotherium in the family Palæotheriidæ, in a subfamily Hippotheriinæ, which was defined as follows: "Bicipital groove of humerus double; molars with cement in the valleys." This subfamily embraces the genera Hippotherium Kaup, and Protohippus Leidy. The Palæotheriidæ is here only distinguished as a whole from the Equidæ by the presence of perfect second and fifth digits.

The place of Hippotherium in the line of ancestry of the genus Equus

* Stockwell's Mem. on the Sec. Var. of the El. of the Eight Princ. Planets, Smith. Contrib. to Knowl., 232, p. 116.

† Proceedings American Philos. Soc., 1881, p. 399.